

Docket No. S1179

Please substitute the paragraph at page 10, lines 5-9 with the new paragraph as shown in the attached Appendix A.

Please substitute Table 1 at page 11 with the new Table 1 as shown in the attached Appendix A.

In the Claims:

Please cancel claims 15 and 20-26 without disclaimer or prejudice.

Please amend claims 1-4, 6, 7, 9, 11, 12-14 and 16-19 as shown in the attached Appendix B.

REMARKS

Applicant thanks Examiner Wong for her courteous and congenial telephone interviews with his representative on March 11, 2003 and March 12, 2003.

Claims 1-14 and 16-19 are pending in the present application.

Claims 15 and 20-26 are cancelled with this Amendment. Applicant reserves the right to file a divisional on cancelled article claims 20-26.

Claims 1-19 were under examination and were rejected.

The disclosure was objected to because of numerous informalities. Applicant has amended the specification to correct the informalities. No new matter has been added to the specification.

Page 3, line 24 has been corrected from "Pd./tin" to "Pd/Sn".

Page 5, line 19 the phrase "an n air-agitated plating tank" has been corrected by deleting the typographical error "n" and now reads "an air-agitated plating tank".

Page 6, line 7 has been corrected from "and 3.8M and CrO<sub>3</sub>" to read "and 3.8M CrO<sub>3</sub>".

Page 6, line 10 has been corrected from "KJO<sub>4</sub>" to read "KIO<sub>4</sub>". Support in the specification for this amendment is at page 2, line 23.

Page 6, line 18 has been corrected from "0.3 A/dm<sub>3</sub>" to read "0.3 A/dm<sup>3</sup>".

Page 6, line 19 has been corrected from "3 A/dm<sub>3</sub>" to read "3 A/dm<sup>3</sup>".

Page 7, line 13 has been corrected from "KJO<sub>4</sub>" to read "KIO<sub>4</sub>". Support in the specification for this amendment is at page 2, line 23.

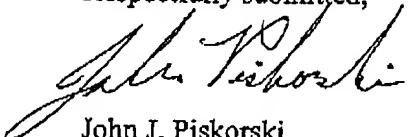
Docket No. 51179

In a telephone conference with Examiner Wong on March 12, the Examiner stated that the rejection under 35 U.S.C. § 103(a) would be withdrawn. Accordingly, the rejection of claims 1, 3-6, 9-13, 15-16 and 18-19 over Duffy is moot.

Favorable consideration and allowance of claims 1-14 and 16-19 are earnestly solicited.

If the Examiner has any questions concerning this response or this application, or if she believes that this application is for any reason not yet in condition for allowance, she is respectfully requested to telephone the undersigned at the number set forth below in order to expedite allowance of this application.

Respectfully submitted,



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## APPENDIX A

Paragraph at page 3, line 21 to page 4, line 2.

A1 ✓ The methods of the invention generally include use of a bismuth treatment step. Subsequent treatment with a sulfide material or composition enables quality metallization of the substrate, e.g. with an electrolytic nickel, copper, gold, silver, platinum or other metal plating composition solution. In contrast to other prior systems, plating catalysts such as Pd, or Pd/Sn, platinum or other metal need not be employed to deposit the metal layer. Also, unstable treatment solutions such cobalt need not be employed.

Paragraph at page 5, lines 16-22.

A2 Preferred electrolytic copper plating compositions for use in accordance with the invention include an aqueous composition that contains an aqueous solution of  $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$  at a concentration of 60 g/l;  $\text{H}_2\text{SO}_4$  at a concentration of 225 g/l; and Cl ions at a concentration of 50 ppm. The treated substrate to be plated is suitably immersed in an air-agitated plating tank outfitted with multiple cathode rails and one rectifier and charged with such a copper plating solution. During plating, the following deposition conditions are suitably employed: current density of  $14.5 \text{ mA/cm}^2$ ; DC waveform was DC; and plating bath temperature of  $25^\circ\text{C}$ .

Paragraph 2 at page 6, lines 3-8.

#### GENERAL COMMENTS TO EXAMPLES

A3 In the following examples, products made of dielectric-plates made of ABS (a copolymer of vinyl cyanide, divinyl and styrene) plastic substance are etched for 5 minutes at room temperature in solution which contains 13M  $\text{H}_3\text{PO}_4$  and 0.5M  $\text{K}_2\text{S}_2\text{O}_8$  or etched for 5 minutes in 60  $^\circ\text{C}$  temperature solution which contains 3.8M  $\text{H}_2\text{SO}_4$  and 3.8M  $\text{CrO}_3$  and rinsed with water.

Paragraph 3 at page 6, line 9-11.

A4 In the following examples, products of dielectric-shock-resistant polystyrene (SAPS) are etched for 5 minutes in solution containing 17M  $\text{H}_2\text{SO}_4$  and 0.5M  $\text{KIO}_4$  under room temperature and rinsed with water.

Paragraph 5 at page 6, lines 16-19.

A5 ✓ When the process is completed, the items are rinsed with distilled water, dried and nickel plated for 15 minutes in Watts electrolyte which contains 1 / 1.2M  $\text{NiSO}_4$ ; 0.15/0.2 M  $\text{NiCl}_2$  and 0.4 / 0.5 M  $\text{H}_3\text{BO}_3$ , initial flow density  $0.3\text{A}/\text{dm}^3$ , which, along the progress of nickel coating from the point of contact, increases to  $3\text{A}/\text{dm}^3$ , under electrolyte temperature of  $40^\circ\text{C}$ .

Paragraph 5 at page 7, lines 11-13.

EXAMPLE 1

Ab ✓ Profiled articles from shock-resistant polystyrene, with surface area of  $70\text{ cm}^2$ , etching 5 minutes at room temperature with 17M  $\text{H}_2\text{SO}_4$  and 0.5M  $\text{KIO}_4$ .

Paragraph 7 at page 8, lines 19-22.

A7 ✓ After etching, plates are rinsed with water and treated for 2 minutes in a solution containing 0.3M bismuth acetate and 0.35M acetic acid, at room temperature. After this, plates are rinsed in water and treated for 30 seconds in a sulphide solution which contains 0.01M  $\text{Na}_2\text{S}$ , at room temperature.

Paragraph at page 9, line 22 to page 10, line2.

AS ✓ After etching, plates are rinsed with water and treated for 2 minutes in a solution containing 0.01M  $\text{BiCl}_3$  and 0.03M  $\text{HCl}$ , at room temperature. After this, plates are rinsed in water and treated for 30 seconds in a sulphide solution which contains 0.25M  $\text{K}_2\text{S}$  at room temperature.

Paragraph at page 10, lines 5-9.

A9 ✓ Data about coating qualities are given in Table 1 below. Data shown in Table 1 below indicate that under different dielectric items and different regimes of their etching, the new method of producing coatings is not longer and the quality of the coating is not inferior to that obtained by known methods, while in some cases the quality of the new method coating is indeed superior.

APPENDIX B

Please amend the claims as follows:

*B* *A10*  
1. A process for metal deposition, comprising treating a dielectric with a bismuth material and a sulfur material and metal plating the dielectric.

2. The process of claim 1 wherein the dielectric is treated with trivalent bismuth.

3. The process of claim 1 or 2 wherein the dielectric is first treated with the bismuth material and then treated with the sulfur material.

*5A.* The process of claim 1 or 2 wherein the sulfur material is a sulfide reagent.

*7B.* The process of claim *6* wherein the sulfide reagent is a sulfur salt.

*A11* *8A.* The process of claim 1 wherein the dielectric is treated with a solution of the bismuth material.

*A12* *10A.* The process of claim 1 wherein the dielectric is treated with a solution of the sulfur material.

*12A.* The process of claim 1 wherein the dielectric is metal plated with nickel.

*13A.* The process of claim 1 wherein the dielectric is metal plated with copper.

*14A.* The process of claim 1 wherein the dielectric is metal plated with gold.

*15A.* The process of claim 1 wherein the dielectric is treated with an etchant prior to treatment with the bismuth material.

*16A.* The process of claim 1 wherein the dielectric comprises an epoxy resin, ABS, or a polyetherimide.

*A14* *17.* The process of claim 1 wherein the dielectric is an electronic packaging dielectric.

*18.* The process of claim 1 wherein <sup>the</sup> metal provides a decorative or protective function.

*4 16.* The process of claim 3 wherein the dielectric is treated with water after treatment with the bismuth material and before treatment with the sulfur material.

#9 attach

**VERSIONS WITH MARKINGS SHOWING CHANGES MADE**

Paragraph at page 3, line 21 to page 4, line 2.

The methods of the invention generally include use of a bismuth treatment step. Subsequent treatment with a sulfide material or composition enables quality metallization of the substrate, e.g. with an electrolytic nickel, copper, gold, silver, platinum or other metal plating composition solution. In contrast to other prior systems, plating catalysts such as Pd, or Pd-TinPd/Sn, platinum or other metal need not be employed to deposit the metal layer. Also, unstable treatment solutions such cobalt need not be employed.

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Preferred electrolytic copper plating compositions for use in accordance with the invention include an aqueous composition that contains an aqueous solution of  $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$  at a concentration of 60 g/l;  $\text{H}_2\text{SO}_4$  at a concentration of 225 g/l; and  $\text{Cl}^-$  ions at a concentration of 50 ppm. The treated substrate to be plated is suitably immersed in an air-agitated plating tank outfitted with multiple cathode rails and one rectifier and charged with such a copper plating solution. During plating, the following deposition conditions are suitably employed: current density of  $14.5 \text{ mA/cm}^2$ ; DC waveform was DC; and plating bath temperature of  $25^\circ\text{C}$ .

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In the following examples, products made of dielectric-plates made of ABS (a copolymer of vinyl cyanide, divinyl and styrene) plastic substance are etched for 5 minutes at room temperature in solution which contains 13M  $\text{H}_3\text{PO}_4$  and 0.5M  $\text{K}_2\text{S}_2\text{O}_8$  or etched for 5 minutes in 60 °C temperature solution which contains 3.8M  $\text{H}_2\text{SO}_4$  and 3.8M  $\text{CrO}_3$  and rinsed with water.

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When the process is completed, the items are rinsed with distilled water, dried and nickel plated for 15 minutes in Watts electrolyte which contains 1 / 1.2M NiSO<sub>4</sub>; 0.15/0.2 M NiCl<sub>2</sub> and 0.4 / 0.5 M H<sub>3</sub>BO<sub>3</sub>, initial flow density 0.3 A/dm<sup>2</sup>, 0.3A/dm<sup>3</sup>, which, along the progress of nickel coating from the point of contact, increases to 3 A/dm<sup>2</sup>, 3A/dm<sup>3</sup>, under electrolyte temperature of 40° C.

Paragraph 5 at page 7, lines 11-13.

EXAMPLE 1

Profiled articles from shock-resistant polystyrene, with surface area of 70 cm<sup>2</sup>, etching 5 minutes at room temperature with 17M H<sub>2</sub>SO<sub>4</sub> and 0.5M KIO<sub>4</sub>, KIO<sub>4</sub>.

Paragraph 7 at page 8, lines 19-22.

After etching, plates are rinsed with water and treated for 2 minutes in a solution containing 0.3M bismuth acetate and 0.35M acetic acid, at room temperature. After this, plates are rinsed in water and ~~for~~ treated for 30 seconds in a sulphide solution which contains 0.01M Na<sub>2</sub>S, at room temperature.

Paragraph at page 9, line 22 to page 10, line2.

After etching, plates are rinsed with water and treated for 2 minutes in a solution, solution containing 0.01M BiCl<sub>3</sub> and 0.03M HCl, at room temperature. After this, plates are rinsed in water and treated for 30 seconds in a sulphide solution which contains 0.25M K<sub>2</sub>S at room temperature.

Paragraph at page 10, lines 5-9.

Data about coating qualities are given in Table 1 below. Data shown in Table 1 below indicate that under different dielectric items and different regimes of their etching, the new method of producing coatings is not longer and the quality of the coating is not inferior to that obtained by known methods, while in some cases the quality of the new-new method coating is indeed superior.

TABLE I  
EXAMPLES

Composition of solutions, technological and quality indices of coatings	1 (control)	2	3 (control)	4	5	6 (control)	7
Dielectric							
Etching solution	$H_2SO_4 + H_2O + K_2IO_4, KIO_4$	$H_2SO_4 + H_2O + K_2IO_4, KIO_4$	$H_2SO_4 + H_2O + K_2S_2O_8$	$H_2SO_4 + H_2O + K_2S_2O_8$	$H_2SO_4 + H_2O + K_2S_2O_8$	$H_2SO_4 + H_2O + K_2S_2O_8$	$H_2SO_4 + H_2O + H_2O + CrO_3$
Metallic ion solution composition (m) and stability: stable (+) or unstable (-)	$CoF_3 - 0.01$ $NH_4OH - 0.12$	$Bi(NO_3)_3 - 0.01$ $HNO_3 - 0.03$	$CoCl_2 - 0.3$ triethanolamine - 07	$Bi(CH_3COO)_3 - 0.3$ $CH_3COOH - 0.35$	$Bi(NO_3)_3 - 0.005$ $HNO_3 - 0.01$	$CoF_3 - 0.01$ $CoF_3 - 0.01$ monoethanolamine - 0.04	$BiCl_3 - 0.01$ $HCl - 0.03$
Quantity of consecutive treatments in solution	1	1	1	1	1	1	1
Nickel plating of plastic surface, complete (+) or incomplete (-)	+	+	+	+	+	+	+
Speed of electroplating spread from point of contact, cm/min	3.4	5.7	2.3	6.8	3.4	3.4	6.8
Smoothness of coating	Smooth	smooth	smooth	smooth	smooth	smooth	smooth
Dielectric metal-coated selectively (+) or non-selectively (-)	+	+	+	+	+	+	+

Please amend the claims as follows:

1. (Amended) A process for metal deposition, comprising treating a substrate dielectric with a bismuth material and a sulfur material and metal plating the substrate dielectric.
2. (Amended) The process of claim 1 wherein the substrate dielectric is treated with trivalent bismuth.
3. (Amended) The process of claim 1 or 2 wherein the substrate dielectric is first treated with a the bismuth material and then treated with a the sulfur material.
4. (Amended) The process of any one of claims 1 through 3 claim 1 or 2 wherein the substrate is treated with sulfur material is a sulfide reagent.
6. (Amended) The process of any one of claims 1 through claim 5 wherein the sulfide reagent is a sulfur salt.
7. (Amended) The process of any one of claims 1 through 6 claim 1 wherein the dielectric substrate is treated with a solution of the bismuth material.
9. (Amended) The process of any one of claims 1 through 8 claim 1 wherein the dielectric substrate is treated with a solution of the sulfur material.
11. (Amended) The process of any one of claims 1 through 10 claim 1 wherein the dielectric substrate is electrolytically metal plated with nickel.
12. (Amended) The process of any one of claims 1 through 10 claim 1 wherein the dielectric substrate is electrolytically metal plated with copper.
13. (Amended) The process of any one of claims 1 through 10 claim 1 wherein the dielectric substrate is electrolytically metal plated with gold.
14. (Amended) The process of any one of claims 1 through 13 claim 1 wherein the dielectric substrate is treated with an etchant prior to treatment with the bismuth material.
16. (Amended) The process of any one of claims 1 through 15 claim 1 wherein the dielectric substrate surface comprises an epoxy resin, ABS, or a polyetherimide.
17. (Amended) The process of any one of claims 1 through 16 claim 1 wherein the dielectric substrate is an electronic packaging dielectric substrate.
18. (Amended) The process of any one of claims 1 through 16 claim 1 wherein the metal plate provides a decorative or protective function.

19. (Amended) The process of any one of claims 1 through 18, claim 3 wherein the dielectric substrate is treated with water after treatment with the bismuth material and before treatment with the sulfide-sulfur material.